US Offshore Wind

Critical role of investigative science in offshore development success and importance an of integrated programmatic approach

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Northwest Offshore Wind

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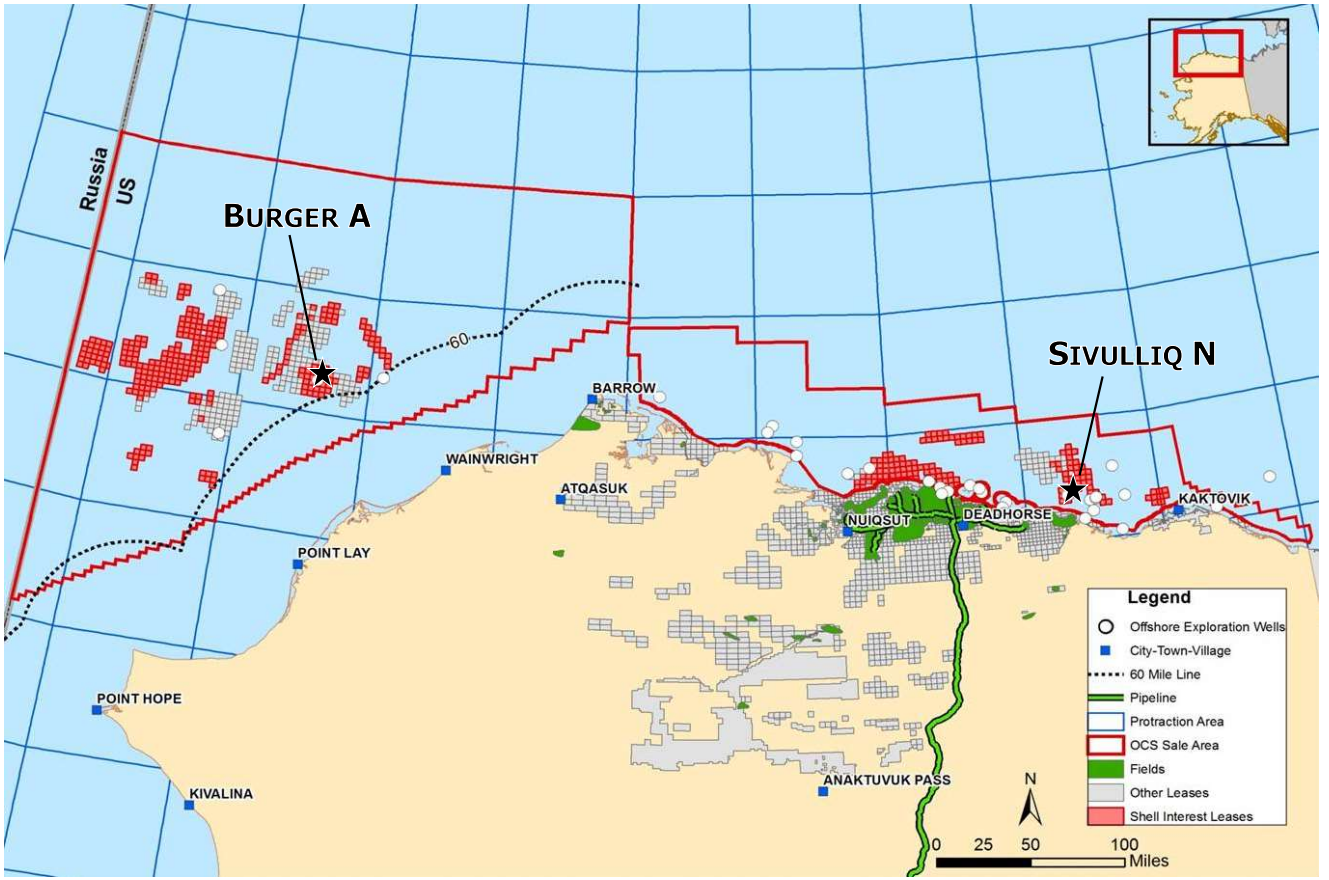
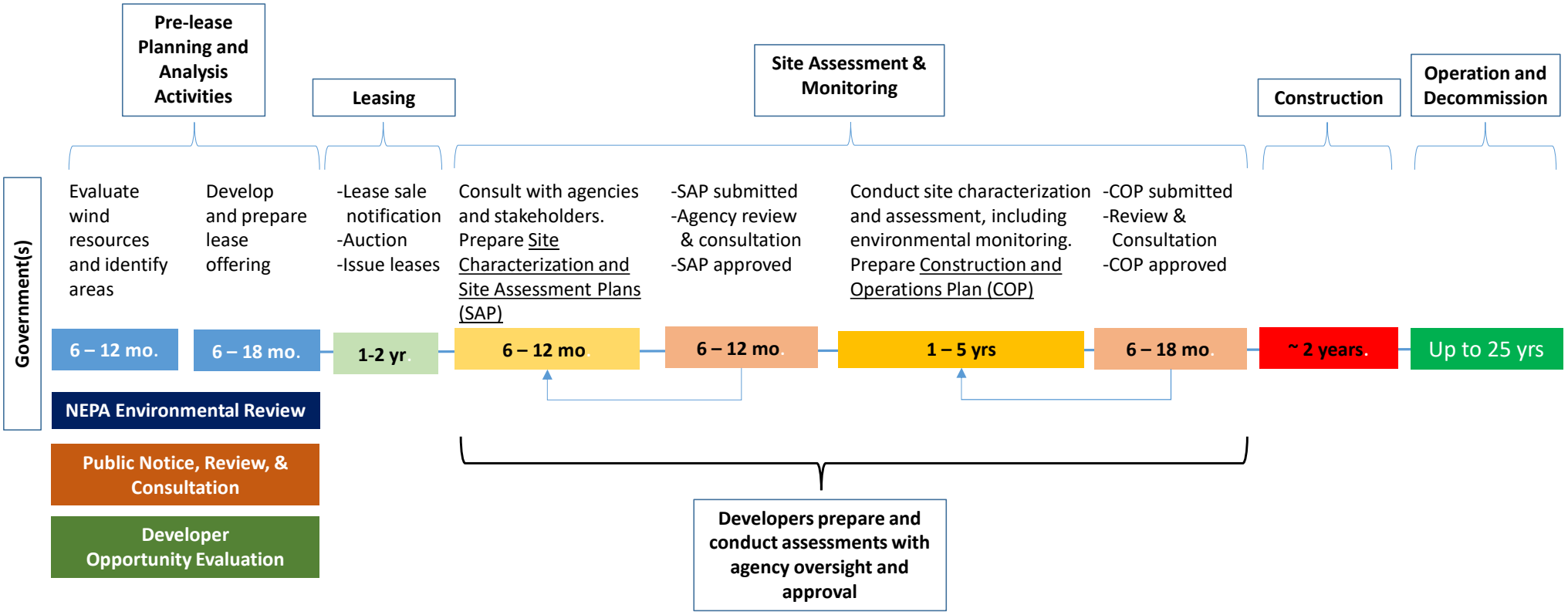
The Value of Integration and Collaboration



The Offshore Wind Project Life Cycle



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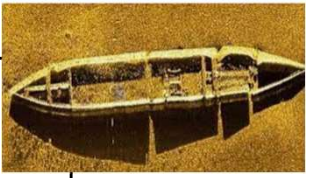
What data are included in Site Characterization and Site Assessments

Physical Characteristics
- Wind
- Ocean currents/waves
- Sea bed

Economic Assessment
- Fisheries & Fishing
- Shipping
- Recreation (tourism)
- Property value

Biological Assessment
- Survey of presence as well as assessment of potential impacts
- Marine mammals
- Birds
- Marine turtles
- Fishes
- Benthos



Cultural Assessment
- Archaeology
  - Ship wrecks
  - Historic or prehistoric
- Native rights & religious observations

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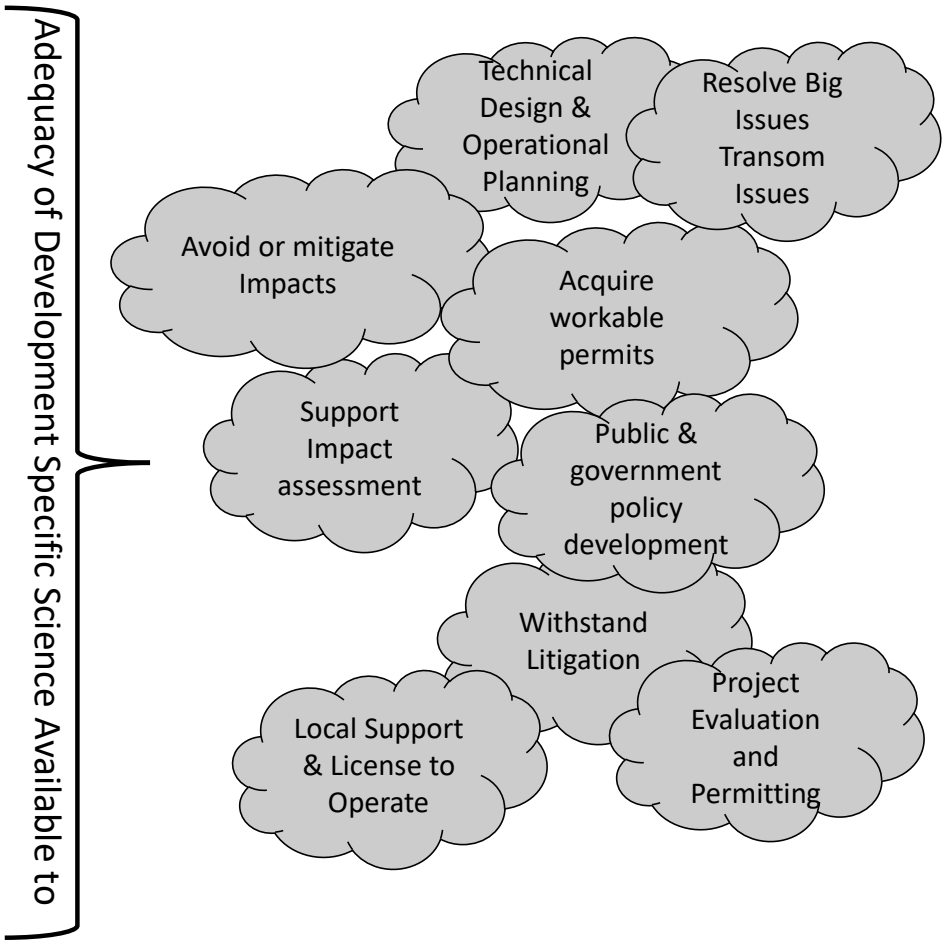
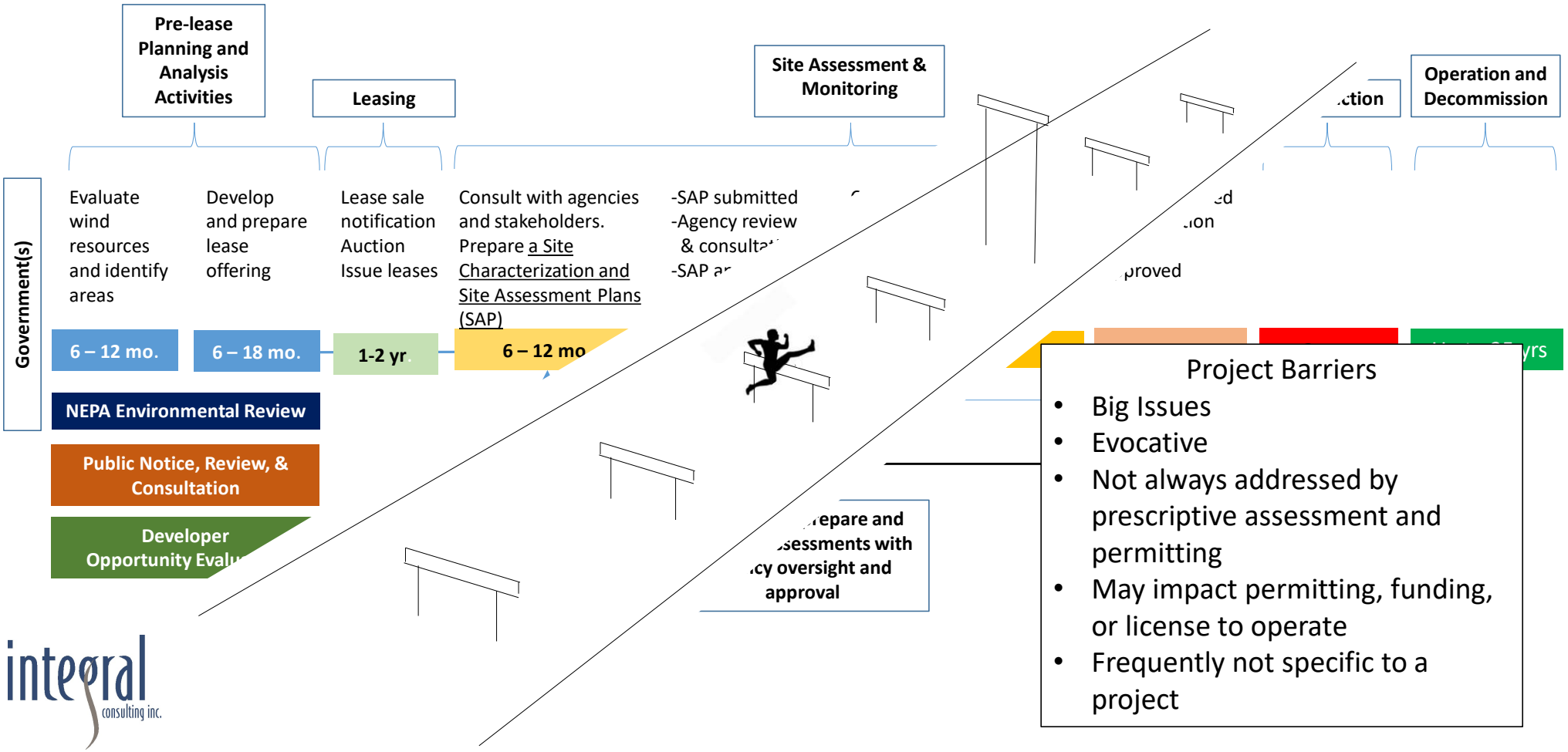
Roles Served by Science (Environmental Observational Data)

- Challenging physical environment
- Sensitive biological resources
  - Iconic animals / landscape
- Marine sound & marine mammals
- Culture & social system
  - Communities and key stakeholders
  - Indigenous people
- Commercial Uses
  - Fisheries
  - Recreational
- Oil spill
  - Fate and effects

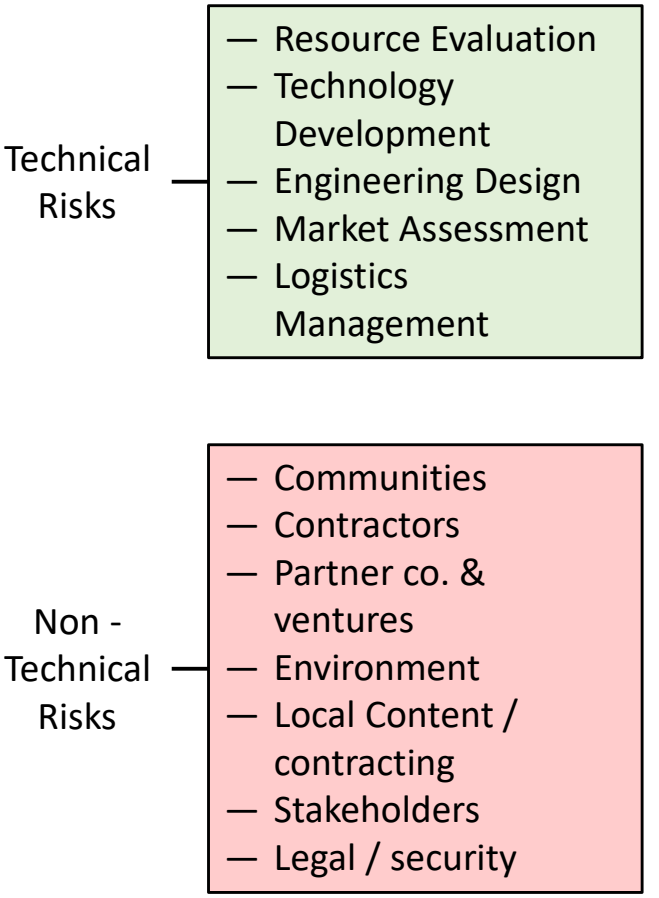


Non-Technical Risks may translate to project barriers



Technical Risks versus Non-Technical Risks

- 70-80 % of failure of capital projects to meet cost or time goals is driven by Non-technical Risks
- Non-technical risks - all risks and opportunities that arise from the interactions of a business with its broad range of external stakeholders
- Frequently not identified or addressed through prescriptive project delivery and permitting procedures



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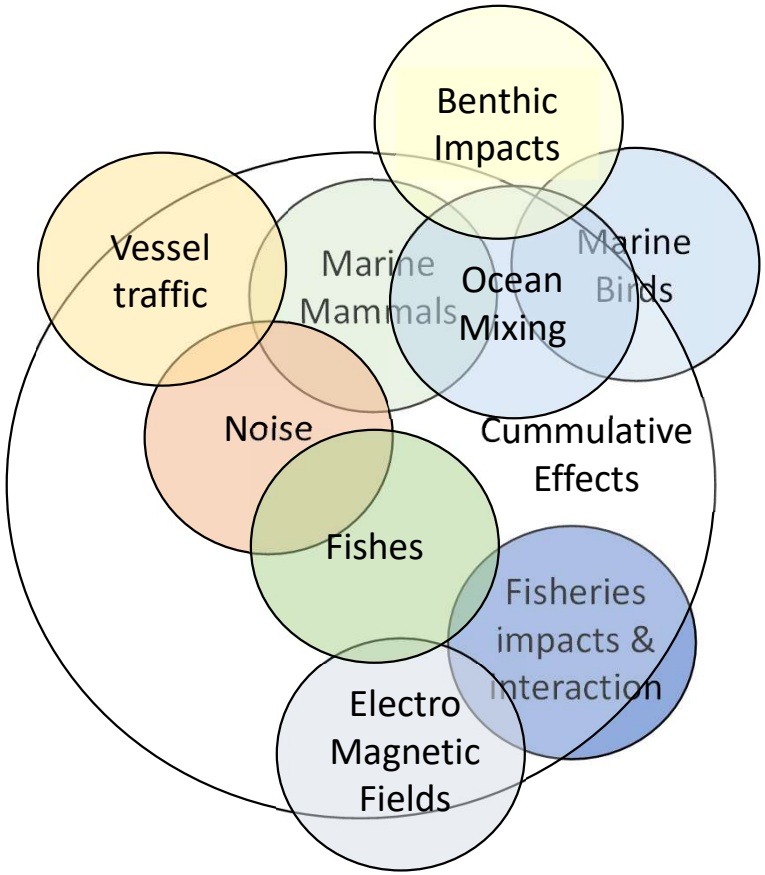
Examples of Environmental “Big Issues” and Potential Overlap



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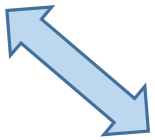
Managing the Big Issues

Stakeholder Engagement
- Identify
- Assess
- Prioritize
- Engage
- Monitor

Permitting Strategy
- Address information needs
- Monitoring effective & efficient
- Understand linkages



Science for a success case

- Identify and understand the "Big Issues" – Early action may avoid future obstacles, costs, and delays
- Integrate science initiatives - There will likely be multiple data streams serving multiple seemingly unrelated needs. Understand where these multiple streams may serve other needs and communicate.
- Invest in the "Collective" – Many big issues are not unique to specific places, times, and projects and may not be answered by project focused or trustee focused initiatives

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Thinking Holistically About Science

Recognize interrelatedness of what may seem disparate data

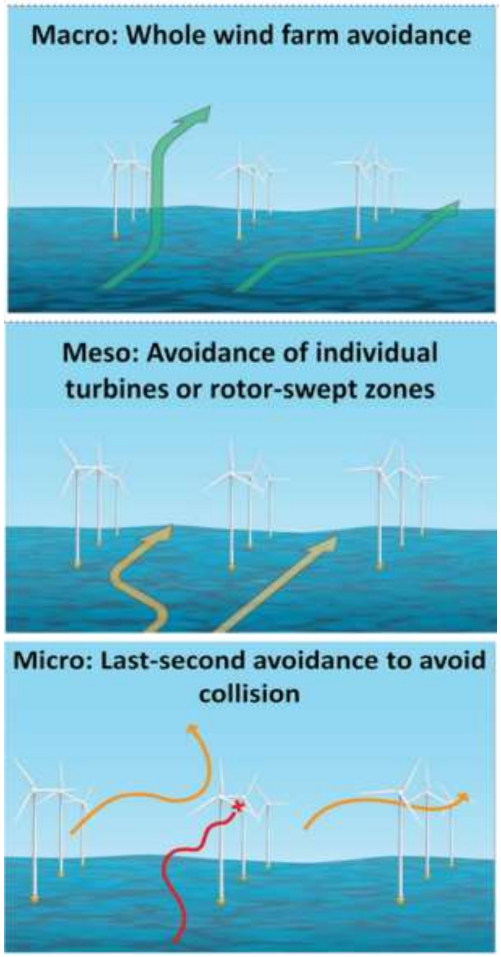
Look for opportunities to integrate data collection, management, and analysis

Look for opportunities to collaborate

- Industry trade groups and companies
- Stakeholders (communities, nation entities, potentially affected industries
- Government entities

Marine Birds

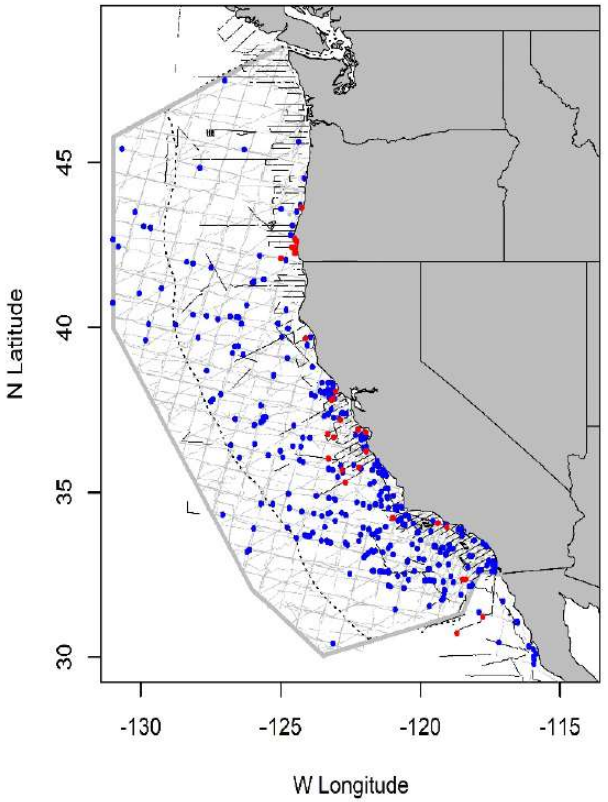
- Protected Species
  - — Endangered Species Act / Migratory Bird Treaty Act
  - — Murres, Murrelets, Albatross, Shearwaters, Petrels
  - — Offshore foraging grounds
  - — Utilze wind to travel long distances
- Data Gaps
  - — Disruption of species in offshore wind areas
  - — Habitat and temporal patterns
- Relative risk
  - — Behavioral avoidance patterns



Marine Mammals Sound & Ecosystem Function

- Protected Species
  - Endangered Species Act
  - Marine Mammal Protection Act
- > 30 Species off California, Oregon, Washington; 10 ESA listed

- Potential effects of Offshore Wind Development
  - Noise from pile driving, platform installation and vessel operations may cause physical impairment, avoidance behavior, interfere with critical communication, and impact key life processes (mating, rearing, feeding, migration)
  - Displacement
  - Entanglement
  - Presence of OSW infrastructure may have the potential to impact oceanographic & ecosystem processes, e.g. mixing and nutrient availability



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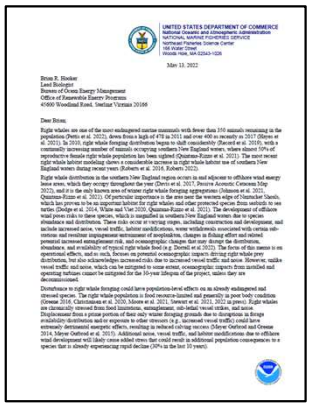
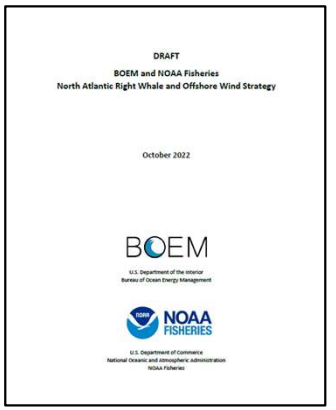
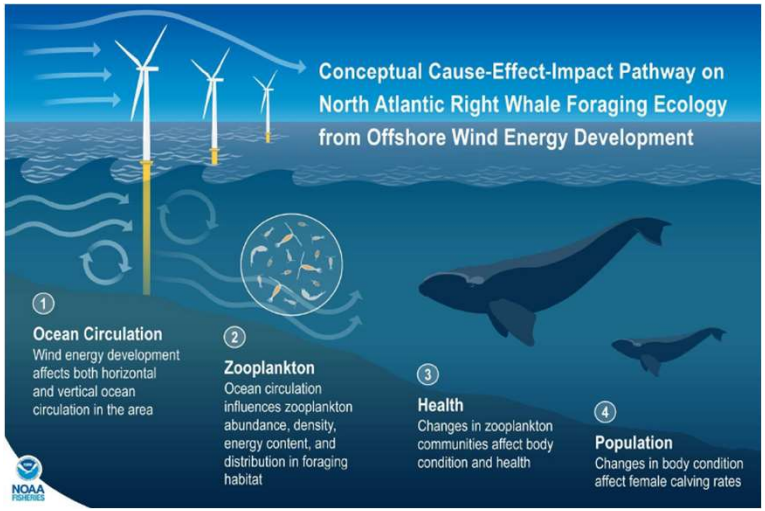
Ecosystem and Ecosystem Services

- Downwind from turbines there is a measurable “wind shadow”
  - — Decreased wave height
  - — Potential for decreased upwelling, turnover, and mixing
  - — Potential stratification
- Down current from turbines flow may be more turbulent
  - — Disruption of stratification
  - — Increased turbulence
- Potential changes in productivity
  - — Ecosystem and species effects







Fishes and Fisheries

- Two separate but related issues
  - — Fishes refers to the faunal diversity, abundance, productivity and health of fish fauna
  - — Fishery refers to the harvest of fish and the economic and social benefits of the harvest
- The North American Pacific coast has many of the most abundant and economically important fisheries
- Deeply ingrained in the history and culture of the area
- Important recreational resource
- Potential to impact access to areas
- Potential to impact gear
- Potential to impact harvest quotas
  - Potential for ecosystem changes to impact productivity

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